

PATENT SPECIFICATION



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COMPLETE SPECIFICATION

Improvements relating to Axial Thrust Bearings

We, DAIMLER-BENZ AKTIENGESELLSCHAFT, of Stuttgart-Unterturkheim, Germany, a Company incorporated under the laws of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns improvements relating to axial thrust bearings in hydrostatic gearing of the kind in which power is transmitted by the displacement of liquid under hydrostatic pressure between a pump unit and a motor unit. The hydrostatic pressure sets up large axial thrusts in these units and it is with the bearings for taking up these thrusts that the invention is concerned. It may be impossible to fit normal thrust bearings of sufficient size and an object of the invention is to obviate this difficulty.

According to the invention, in an axial thrust bearing in a hydrostatic gearing, the working medium of the said gearing serves as thrust-supporting fluid-pressure medium for the bearing. The axial thrust may be taken by means of a number of thrust surfaces supported by the fluid pressure medium. The thrust surfaces may suitably be surfaces of pistons acting on the same pressure space or on pressure spaces connected to each other. In a preferred such form of embodiment of the invention, thrust surfaces acting on the same pressure space are surfaces of annular pistons concentric with each other. The pistons preferably have the same effective cross-section. However, use may be made of separated pistons. For example, three pistons arranged in a star pattern may be provided for each of a plurality of thrust-bearing elements.

Two embodiments of the invention by way of example are illustrated in the accompanying drawings, in which:—

Fig. 1 is an axial section through one embodiment;

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Fig. 2 an axial section through the second embodiment; and

Fig. 3 a plan view of the second embodiment, as seen on the section line 3-3 in Fig. 2.

In the embodiment of Fig. 1, one member 10 of a hydrostatic gearing fast on a shaft 11 is supported on the one hand in roller bearings 12 and on the other hand in a ball bearing 13. Axial thrust ball bearings 15, 16 and 17 arranged axially one behind the other serve to take up axial thrust acting in the direction of the arrow *x*. Whereas the bearing 15 receives axial thrust directly from the member 10, axial thrust is transmitted to the bearings 16 and 17 by sprung-on rings or circlips 18 and 19.

The bearing rings 20, 21 and 22 of the bearings 15, 16 and 17 are provided at their circumferences with cylindrical annular parts 23, 24 and 25 concentric with one another. These parts form annular pistons sliding one on the other, the outermost piston 23 sliding in an external cylinder 26 and the innermost piston 25 on an internal cylindrical body 27. A housing 28 formed with the cylindrical parts 26 and 27 encloses, together with the pistons 23, 24 and 25, an annular cylindrical space 29 to which oil is supplied under pressure through a conduit 30 from the source of high pressure for the hydrostatic gearing, for example and as illustrated a gearwheel pump 31, or a pressure accumulator, so that any oil leakage at the sliding surfaces is constantly made up.

The thrust acting in the direction of the arrow *x* is distributed, through the bearings 15, 16 and 17, between the pistons 23, 24 and 25. If the pistons have the same effective annular cross-section, uniform distribution of the axial thrust between the bearings is ensured. The thrust is ultimately taken up by the oil in the space 29.

In the embodiment of Figs. 2 and 3, bearing rings 120, 121 and 122 associated with axial thrust bearings 115, 116 and 117 are 90

extended radially outside the bearings, for example and as shown in Fig. 3 to form equilateral triangular members, each ring bearing independently against a plurality of
 5 pistons arranged in a star pattern. As illustrated, the extended ring 120 bears at the corners of its triangular shape against pistons 132a, 132b and 132c, the ring 121 against
 10 similarly disposed pistons 133a, 133b and 133c and the ring 122 against similarly disposed pistons 134a, 134b and 134c. The cylinders for the pistons are connected to one another and to a conduit 130 from a
 15 pump 131. The pump 131, like the pump 31, serves at the same time, in a manner not illustrated, to supply the high pressure for the hydrostatic gearing on the shaft 111.

The piston surfaces are so dimensioned that the total force exerted by the pressure
 20 medium is equal to or greater than the smallest axial thrust arising.

What we claim is:—

1. Bearing in a hydrostatic gearing, for taking up the axial thrust produced by the
 25 hydrostatic pressure, wherein the working medium of the said gearing serves as thrust-supporting fluid-pressure medium for the bearing.

2. Axial thrust bearing according to Claim
 30 1, wherein the axial thrust is taken by means of a number of thrust surfaces supported by the fluid-pressure medium.

3. Axial thrust bearing according to Claim
 35 1 or 2, wherein the thrust surfaces are surfaces of pistons acting on the same pressure space or on pressure spaces connected to each other.

4. Axial thrust bearing according to Claim
 3, wherein the pistons are concentric annular
 40 pistons.

5. Axial thrust bearing according to Claim
 4, wherein a plurality of thrust-bearing elements, particularly ball-bearing elements, are
 45 arranged axially one behind the other and bearing rings or annular parts connected thereto and supporting the same are connected to the annular pistons which act on the same pressure space.

6. Axial thrust bearing according to Claim
 5, wherein the pistons have the same effective
 50 cross-section.

7. Axial thrust bearing according to Claim
 3, wherein the thrust surfaces are surfaces of separated pistons, a plurality of pistons
 55 being provided for each of a plurality of thrust-bearing elements.

8. Axial thrust bearing according to Claim
 7, wherein the individual pistons are distributed uniformly around the circumference
 60 and the sets of pistons for the individual bearing elements are offset in relation to each other in the circumferential direction.

9. Axial thrust bearing according to Claim
 7 or 8, wherein three pistons disposed in a
 65 star pattern are provided for each bearing element.

10. Axial thrust bearing constructed and
 arranged substantially as hereinbefore described and as illustrated by Fig. 1 or Figs. 2
 70 and 3 of the accompanying drawings.

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COMPLETE SPECIFICATION

3 SHEETS

This drawing is a reproduction of
the Original on a reduced scale.

SHEET 1

Fig. 1

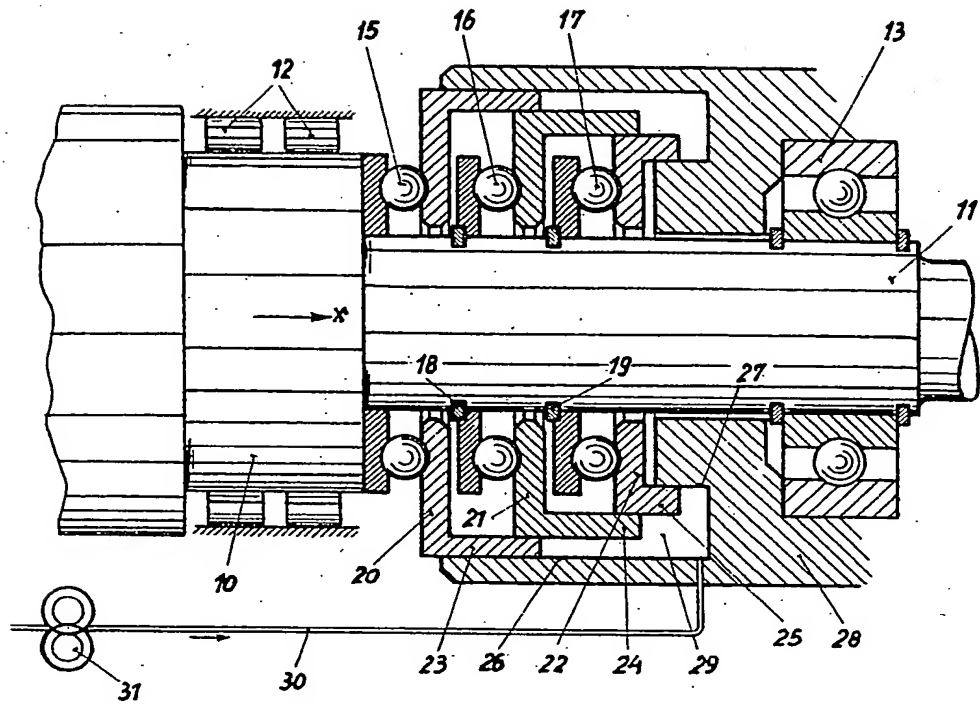


Fig. 2

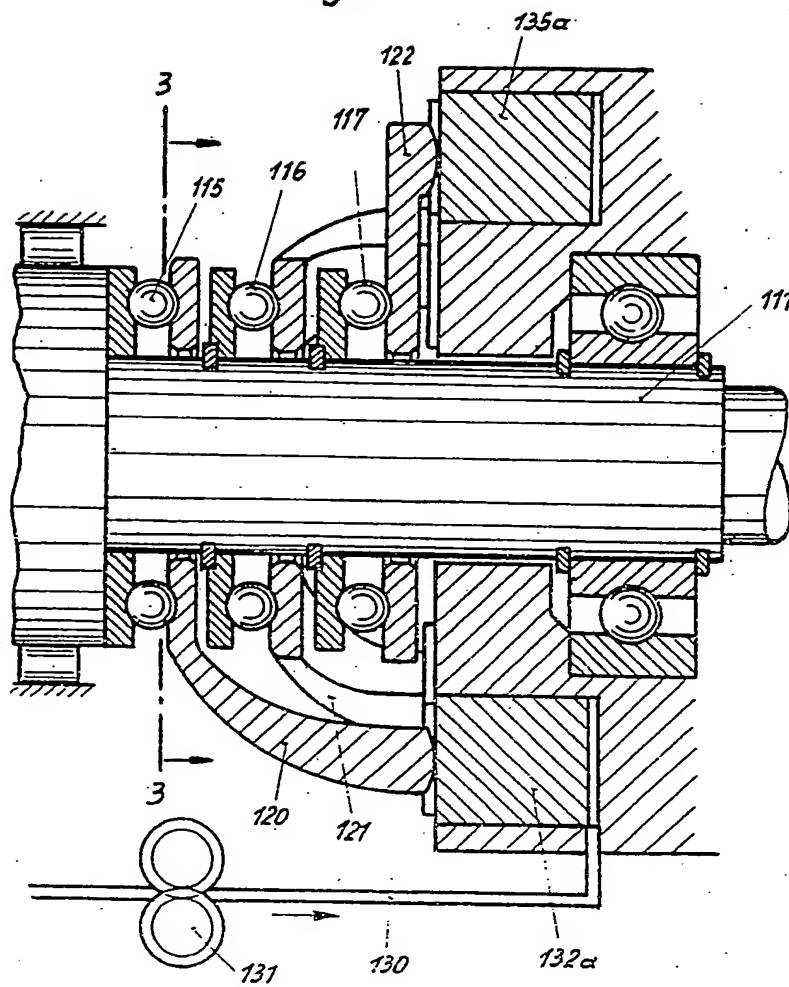


Fig. 3

